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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Multi-colour Sheet-fed Letterpress Rotary Printing Machine

We, SCHNELLPRESSENFABRIK KOENIG & BAUER AKTIENGESELLSCHAFT, a German company, of Friedrich-Koenig-Strasse 4, Würzburg 7, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The invention relates to a multi-colour sheet-fed letterpress rotary printing machine especially for printing from wrap-around plates having two vertically aligned plate cylinders bearing on one impression cylinder.

Two-colour printing machines such as offset machines are known having so-called "five cylinder printing units", in which there is one common impression cylinder for two printing units disposed approximately one above the other. In this type of construction the separate sheet is transferred from one printing unit to the next in sequence by endless gripper chains, which pass from the impression cylinder down underneath the printing mat, past a low transverse walkway, accessible by a step up from the printshop floor, and then rise steeply before the next unit. In the existing two-colour units, the top inking unit is set up in fixed side frames to form turrets above the crowns of their respective plate cylinders, while the bottom inking unit is mounted in horizontal frames that can be moved out horizontally. This movement of the bottom inking unit thus represents the operating space of the plate cylinders and at the same time determines the minimum space between a printing unit and the sheet delivery or the next printing unit. Hence, for every printing unit, there must be a separate operating space of adequate size, in the form of a transverse walkway through the machine. This requirement results in machines of considerable over-all length, especially in the case of multi-colour machines made on the unit-construction principle from a series of two-colour units of standard design. In addition to this, while the turret arrangement of the top inking unit leaves the upper one of the two plate cylinders open for lateral operating, it adds considerably to the height of the machine. Moreover, offset machines of this kind, in particular, do not afford satisfactory access to the cylinders, even from the boarded footway in the transverse walkway of the machine.

Furthermore, in existing two-colour printing units intended for the unit-construction assembly of four-colour and six-colour machines, where each unit has one of its two inking units removable, these two inking units suffer from the drawback of being differently positioned. In one inking unit the forme-inking rollers bear on the plate cylinder under their own weight, whereas, in the other unit they are set from below upwards against the force of gravity.

The principle on which the invention is based is that it is an advantage, with three-cylinder printing units for two-colour letterpress work, for both inking units to be mounted so that they can be withdrawn together and so disposed that they can be steeply raised at the same oblique angle, as in flat bed printing presses, where the inking unit is withdrawn from its flat forme.

The invention proposes that for multi-colour letter-press machines, the gap between the pair of plate cylinders of one printing unit and the next unit, whether this be a printing unit or a deep-pile delivery, shall be kept so short that the corresponding space shall be just large enough either for the two-colour unit in its working position or, when the two-colour unit that can be raised obliquely is in the withdrawn position, to constitute the requisite operating space for

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access to the plate cylinders, in the form of the usual transverse walkway through the machine, accessible from the shop floor. In this way, the separate operating space that is otherwise usual at the back of each printing unit can be done away with; the necessary transverse walkway through the machine does not exist until the two-colour inking unit has been raised obliquely, because in the running condition the space between the plate cylinders and the neighbouring unit is in fact occupied by the lowered inking unit. This construction enables the four requirements which had hitherto been regarded as irreconcilable to be simultaneously satisfied. The height of the machine is restricted; the impression cylinder is readily accessible from the floor, without steps; the over-all length of the machine is comparatively small; and a deep-pile delivery can be used in conjunction with it. Multi-colour machines for letterpress work can therefore be designed on very compact lines, without restriction of access. The small over-all length, obtainable notwithstanding the limitation in the height, is of particular advantage with four-colour and six-colour machines made up by unit-construction from a series of printing units. The printing cylinders also can be mounted low and be accessible from the floor. As the endless sheet transfer chains for coupling the individual units can be diverted upwards from near floor level immediately behind the printing unit, they return within the shortest possible distance—and with an appropriate number of grippers—to the height required for a deep-pile delivery or for conveying to the next printing unit.

With this construction of printing and inking units, the inking units are so designed and accommodated that the circumference of at least two, or even three, forme-inking rollers is greater than the maximum printing length. This obviates all the difficulties associated with high-speed letterpress printing machines, resulting from the use of small forme-inking rollers, and is particularly important in a multi-colour printing machine of the construction under consideration, since the forme is inked only once per sheet. The large forme-inking rollers cover the plate with a continuous fresh film of ink at each impression. The forme-inking rollers are only slightly larger than the maximum printing length, while not equalling the plate cylinders in diameter, so that there is a constant lag between plate cylinder and inking roller, which checks the formation of a ridge of ink on the rollers. Additional small distributing top rollers on the forme-inking rollers can be fitted to follow the inking line.

This construction is fundamentally different from the existing method, used on converted offset presses, in which the inking is carried out by a single forme-inking roller of precisely the same diameter as the plate cylinder.

The accompanying drawings which illustrate the invention represent, by way of example, a four-colour machine with one printing unit in the working position and the other in the making ready position with its inking unit raised clear (Figure 1), and a basic two-colour unit capable of extension by unit construction, with main drive indicated.

In Figure 1, the sheets are stream-fed from automatic feeder 1 to the front lays of the first printing unit 2, where they are printed in two colours, then taken by accurate registering gripper chain 3 to the second printing unit 4, there receiving two more colours on the same side, and are conveyed by a normal gripper chain 5, to deep-pile delivery 6. Sprayers 7 dust the sheets to prevent set-off.

In the unit construction example illustrated, the two printing units have bottom frames 9 and 10 of equal length so that the machine as a whole can be extended by the addition of further units at the sheet feeder end, that is to say, in front of unit 2. Cylinder frames 11 and 12, which are mounted on the bottom frames, each have an impression cylinder 13/14, and behind this, on the same side and almost vertically one above the other, two plate cylinders, 15 and 16/17 and 18. The plate cylinders, which have the same diameter as the impression cylinders, are inked by two-colour inking units 19 and 20, which can be raised into a position of rest 24[1] at a steep angle, in their common frames 23 and 24, away from the plate cylinders. Inking unit, lower frame 27 and sheet delivery frame 28, which serve as slides inclined at the same angle, are mounted on bottom frames 9 and 10, the same as their corresponding printing unit. The oblique slide tracks 25 and 26, for raising and lowering the inking units run close alongside the inking rollers and ink duct 29 of the lower inking unit 20.

The sheets are fed to the first printing unit 2, by swinging pre-grippers 30. A separate plate 31, which carries the driving mechanism for pre-grippers 30, closes cylinder frame 11 at the top, being fitted over a cut-out portion 32 of the side frame, above impression cylinder 13. Each unit has a cut-out portion. The printed sheets are taken to the next printing unit 4 by accurate registering gripper chain 3, which coming from chain drum 37 adjacent impression cylinder 13, passes underneath the inking unit and is then diverted upwards over a transfer drum 33, thus feeding the sheets onto impression cylinder 14. Approximately level with top plate cylinder 17, gripper chains 5 run closely behind oblique tracks 26 of inking roller frames 24, so that lines 26 and 34 are practically tangential. The distance between the individual units for printing and deep-pile

delivery thus includes no permanent intermediate spaces, being so small that the space between the plate cylinders of one unit and gripper chain conveyances 33/34 of the next unit is just sufficient to accommodate the inking unit when this is lowered, or to serve as a working space 35, for the plate cylinders. Thus an intermediate space between the individual units is created only when the inking unit is raised clear. These intermediate spaces form transverse walkways through the machine, with directly accessible boarded footways 36 in the bottom frames, one step up from the floor.

In the second printing unit 4 there is no need for a swinging pre-gripper 30 or closure plate 31. Cut-out 32 therefore exists here merely as an opening, which leaves impression cylinder 14 open for easy access from the side and from above, whereas in front unit 2 impression cylinder 13 is accessible from between pre-gripper 30 and chain delivery drum 37 or from the front in the space between sheet feeder 1 and the printing unit.

All four inking units are similarly made and approach the printing cylinders from approximately the same position, so that the rollers operate in the same conditions as regards weight. By suitable choice of their angle of inclination and of the spacings between the two inking units and plate cylinders of a unit, there will be enough room at each plate cylinder for at least two—and even, as in the example shown, three extra large forme-inking rollers 38, the circumference of which exceeds the maximum printing length, but is less than the circumference of the plate cylinders. This construction makes the multi-colour printing machines according to the invention particularly attractive, because even very shallow etched flexible letterppress printing (wrap around plates) can be perfectly inked without touching the etching ground, since the rollers are sufficiently inflexible and have no unduly sharp curvature, as compared with the existing printing machines working on the three-cylinder system, which can accommodate only small forme-inking rollers.

To save building height, parts of the transfer chains are run inside bottom frames 9 and 10. Thus the impression cylinders are accessible from below, while the inking units 23 and 24, when lowered, project very little above the deep-pile sheet feeder 1 and delivery 6.

When a two-colour machine (Figure 2) is to be extended, the basic machine 4 and its pile delivery 6 stay as they are, automatic feeder 1 being moved to the right and an extra printing unit (2 in Figure 1) interposed in the resulting space. Swinging grippers 30 and closer plate 31 are transferred from the basic machine shown in Figure 2. Sheet delivery drum 33 is positioned inside newly extended triangular intermediate frame 27. The method of access to impression cylinder 14 of machine 12 in Figure 2 is also changed, by extension as in Figure 1, from front to top through the space vacated by plate 31.

The main drive for each unit is transmitted through worm gear 39 directly to the shafts of chain delivery drums 37 and 40. In four-colour and six-colour machines, the worms are connected by a longitudinal shaft 41. The longitudinal shaft 41 is coupled directly to the main driving motor 43 through a flexible coupling.

The construction proposed according to the invention for obliquely raising the two-colour inking unit can also be used to particular advantage for an ordinary throw-off trip. Both plate cylinders are moved away from the fixed impression cylinder towards the inking unit. The same mechanism 44 serves to raise the entire inking roller frame along with its two-colour unit by a few millimetres by means of cams 45, so that all the forme-inking rollers come clear of the plate cylinders. This lifting device is independent of the mechanisms for fully raising the two-colour inking unit into the position required for adjustment of the plate cylinders.

WHAT WE CLAIM IS:—

1. A multi-colour sheet-fed letterpress rotary printing machine with one impression cylinder cooperating with two plate cylinders disposed approximately one above the other, and employing two-colour inking units which can be withdrawn together, in which the distance between the pair of plate cylinders of one printing unit and the next unit, or a deep-pile sheet delivery device is so small that the space in question is just large enough either for the two-colour unit in its working position or, when the two-colour unit, which can be raised obliquely on a steep track, is in the withdrawn position, to constitute the requisite access space for the plate cylinders in the form of a transverse walkway through the machine.

2. A multi-colour sheet fed letterpress rotary machine in accordance with claim 1, with paper transfer by means of endless gripper chains which pass from the impression cylinder underneath the printing units, and are then diverted upwards before the next unit (printing unit or deep-pile delivery), in which the inclined track of the movable frame carrying the two-colour inking units when approximately at the same height as the deep-pile delivery or the top plate cylinder, runs close to the raising track of the gripper chain and is substantially tangential to the track.

3. A multi-colour sheet fed letterpress rotary machine in accordance with claim 1 or claim 2, having several printing units

connected one behind the other by the unit-construction method, in which the chain transfer drum of each of the printing units connected behind the front unit is carried in triangular members of the sides of the machine, which triangular members carry the inclined track for the inking roller frame of the preceding printing unit, the following printing cylinder frame being bolted to the vertical edges of the triangular members.

4. A multi-colour sheet fed letterpress rotary machine in accordance with claims 1, 2 or 3, having swinging pre-grippers for the first or front printing unit, the impression cylinder of which is operated from the front, in which the cylinder frames of all the printing units are of uniform construction, so that a cut-out in the cylinder frame above the impression cylinder serves in the front printing unit to accommodate special plates for the driving parts of the swinging pre-grippers, it being possible, when the initial printing unit is extended to form a four-colour machine, to remove these plates leaving the cut-out exposed as an opening for operating the impression cylinder from above and from the side.

5. A multi-colour sheet fed letterpress rotary machine, particularly for wrap-around plates, according to any of claims 1, 2 or 3, in which the angular position and spacing of the two inking units and plate cylinders of one printing unit, are such that there is room at each plate cylinder for at least two forme-inking rollers of such dimensions that the circumference of each roller is greater than the maximum printing length, but less than the circumference of the plate cylinder.

6. A multi-colour sheet fed letterpress rotary machine in accordance with claims 1, 2 or 3, in which the two-colour inking unit which can be raised obliquely is moved by a separate mechanism a few millimetres away from its working position into a throw-off position, both plate cylinders being moved simultaneously for throw-off purposes from the fixed impression cylinder towards the inking unit.

7. A multi-colour sheet fed letterpress rotary machine, substantially as hereinbefore described and illustrated with reference to the accompanying drawings.

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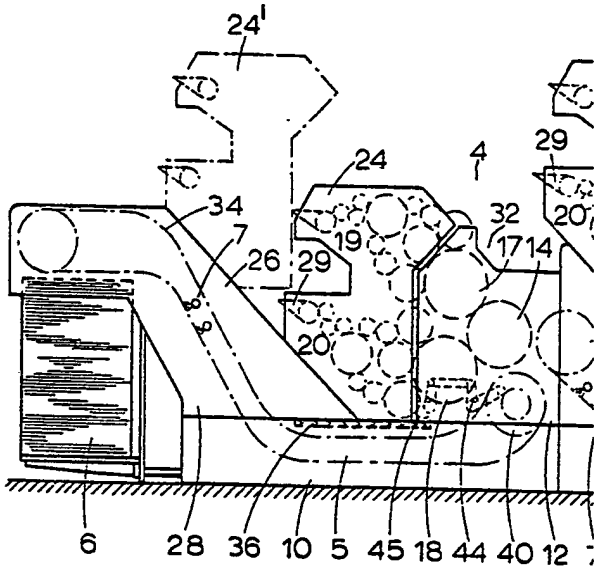
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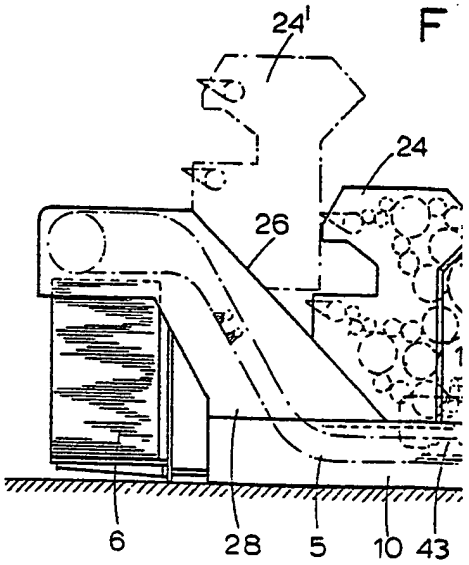
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FIG. 1.

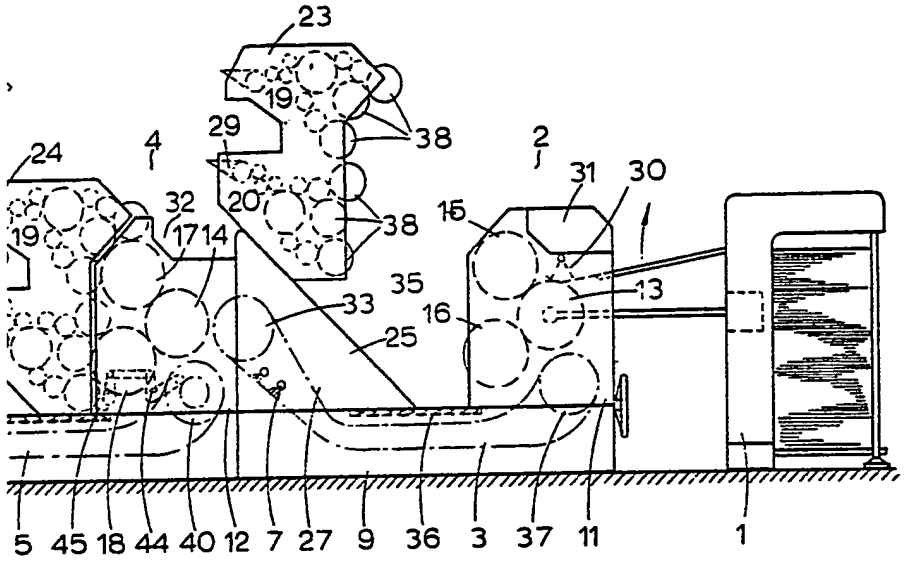
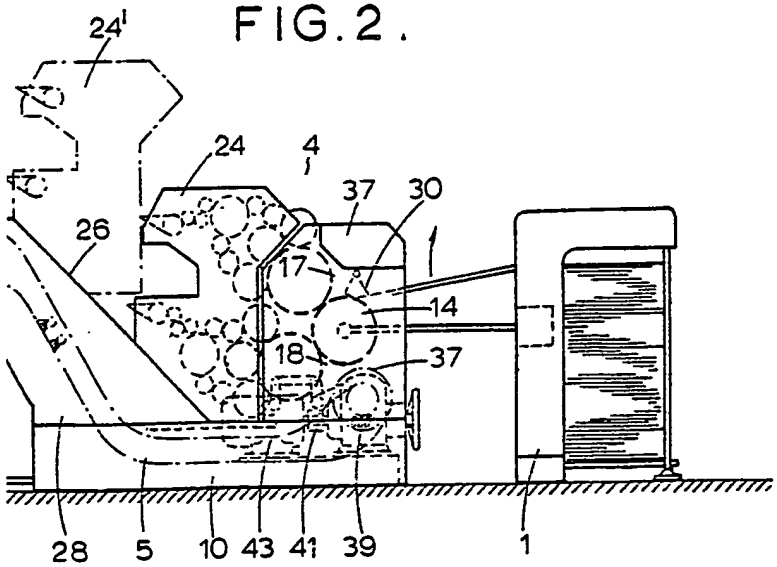


FIG. 2.



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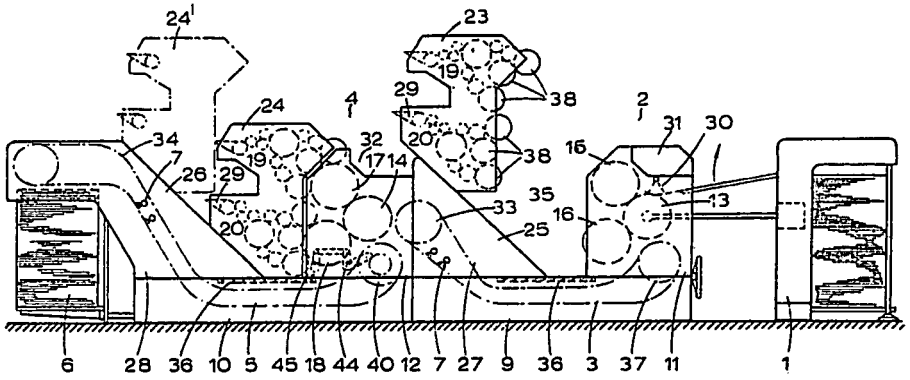

FIG.2.